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Schemes for aggregating preferential tariffs in agriculture, export volume effects and African LDCs

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Abstract

Trade-weighted aggregated tariffs (TWPT) are often used in analyzing the issues of erosion of non-reciprocal preferences. This paper argues that commonly used TWPTs under-estimate the true protection on imports originated from preference-receiving countries, including LDCs. When used in numerical simulations of preference erosion and expansion scenarios, the TWPTs tend to incorrectly downplay preference erosion effect of MFN tariff cuts, and understate the export promotion effect of expanding preferences. In light of these claims, an alternative aggregation scheme is developed to calculate aggregated preferential tariffs imposed by a number of developed countries on African LDCs. These are shown to be higher than the TWPTs aggregated from the same disaggregated tariff data set. Numerical simulations conducted with the two sets of aggregated tariffs confirm the two claims and suggest that TWPTs may lead to misleading policy implications concerning expanding preferences for the LDCs.

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1. Introduction

The recent Hong Kong WTO Ministerial Declaration adopted on December 18, 2005 (WTO, 2005) reconfirmed the Doha ministerial decision that "…developed-country Members, and developing-country Members declaring themselves in a position to do so, agree to implement duty-free and quota-free market access for products originating from LDCs".[1] Underlying this declaration is the concern of preference erosion in connection with expected multilateral trade liberalization.[2]

For policy analysts, examining the extent of erosion of agricultural trade preferences requires accurate measurement of the prevailing Most Favored Nation (MFN) tariff rates imposed on non-preferential imports and the corresponding preferential rates levied on imports originated from the preference-receiving countries, the differences of which are often called the preference margins. Reducing preference margin through unilateral or multilateral MFN tariff reforms may lead to preference erosion. Since model-based numerical assessments of preference erosion are usually conducted on aggregated product categories, it is necessary for analysts to aggregate tariff rates at detailed line levels up to the levels of product categories, as is done in the GTAP database (Dimaranan and McDougall, 2002) where values of bilateral trade flows are used as weights in the aggregation. This practice, however, may lead to under-estimation of the true market access barriers imposed by many countries on imports originated from the LDCs, due to the fact that the LDCs typically only export a handful of products with very small volumes, implying that the aggregate tariff for many products would turn out to be zero of nearly zero.

This under-estimation of aggregated tariffs imposed on LDCs' exports has two serious implications for assessing the extent of preference erosions and for evaluating the merits of expanding current preferential treatment to the LDCs (as agreed in the Hong Kong declaration). The main propositions of this paper are: first, a smaller-than-actual trade-weighted preferential tariff (TWPT) will likely lead to an under-estimation of preference erosion effect of an MFN tariff cut (in terms of reduced exports from the LDCs); second, the trade-promotion effect of enhancing preferences by granting duty and quota free access to the LDCs will also be under-estimated when using the lower-than-actual TWPT. Thus, the seriousness of preference erosions and the desirability

[1] This was also included in the so-called July Package of 2004 (WTO, 2004).

[2] This has been pointed out by a number of studies, including Panagariya (2005). Numerical evidence has also been provided in studies based on quantitative models, such as the study by Yu and Jensen (2005).

of granting duty and quota free market access to the LDCs would be regarded as inconsequential, as claimed in a number of recent studies.

The objective of the paper is to provide some theoretical discussion and numerical support for the above propositions regarding the consequences of incorrectly aggregating preferential tariffs on estimating preference erosion effects and on evaluating the desirability of enhancing preferences for the purposes of mitigating possible erosion of existing preferences. An alternative scheme for aggregation preference tariffs on imports from the LDCs is suggested. The advantage of this scheme is drawn from a series of simulation exercises. Due to the concentration of LDCs in Africa, the focus of this study is on the African LDCs (ALDCs hereafter).

The paper is organized as follows. Section 2 introduces the policy issues of preference erosion and expanding preferential treatment for LDCs. This brings out the relevance of correctly representing aggregated preferential tariffs in quantitative analysis of these issues. Section 3 contains informal theoretical discussion on the likely consequences (in terms of export quantities) of under-estimating levels of preferential tariffs on the extent of preferences erosion and on the desirability of expanding preferential treatment. Section 4 proposes an alternative method for aggregating preferential tariffs and conducts numerical simulations to compare the different export effects of using the trade-weighted and the alternatively aggregated preferential tariffs. Section 5 concludes.

2. Preference erosion and enhancing preferential treatment for LDCs

There have been ongoing debates on the desirability and feasibility of adopting the proposal of enhancing trade preferences for the LDCs. [3] Some worry about the inability of preferences in promoting agriculture exports and economic development in the LDCs and discount the value of preferences as an effective measure of Special and Differential Treatment. This worry is compounded by the fear that the preferential approach may slow down the multilateral liberalization process. Others point out that developing countries in general could gain more from market access reforms based on

[3] In fact, whether developing countries gain more from MFN tariff cuts or lose more from preference erosions has long been discussed in the literature. Some examples of earlier studies are Blackhurst (1972), Baldwin and Murray (1977), and Pomfret (1986). More recent studies can be found in the summary contained in Bureau et al. (2007), which states that "the authors who point out the poor performance of countries that benefited from these preferences have seldom provided convincing evidence about the counterfactual situation without preferences. Econometric results are ambiguous…" (page 176-177, Bureau et al., 2007).

the MFN approach and that the erosion of preferences does not appear to be a serious issue if substantial MFN reforms are conducted multilaterally. Still others argue that the LDCs do not necessarily gain from multilateral trade reforms, that the existing preferences are important to their interests, and that enhanced preferences would help mitigate any adverse effects from multilateral reforms.[4] Lastly, many have noticed that various conditions, clauses and rules attached to existing preference programs may have hindered recipient countries from taking full advantage of these programs and therefore preferences per se should not be held responsible for the poor export performance of the LDCs. Instead of giving up on preferences altogether, some argue that improving these rules will make them more effective.[5] Clearly, this debate has important implications for the LDCs. If indeed preference erosion appears not to be a serious concern, then there would be no point in worrying about possible negative consequences of the multilateral agenda. On the other hand, if preference erosion is non-negligible, then the call for expanding preference programs should be taken seriously.

Numerical model-based simulation exercises have a role to play in this debate. For example, using the GTAP model (Hertel, 1997) and database, one can simulate policy scenarios involving MFN/preferential tariff reductions by preference-granting countries to estimate the magnitude of preference erosion/expansion effects. With a correct representation of the MFN and preferential trade barriers, these exercises may generate useful policy insights. Nevertheless, simulation exercises involving MFN and preferential tariffs by many countries have high data requirement and most likely these exercise can be only conducted in the context of product categories, which requires aggregation of tariff lines.

In the case of LDCs, preferences enjoyed by these countries are typically more favorable than what are offered to other developing countries. However, even for them, existing preference programs often do not provide universal production coverage, leaving intact high import barriers on the excluded products. For instance, data from the USITC data web show that out of around 1800 US tariff lines in agriculture, about 400 MFN tariff lines are duty free. Among the remaining tariff lines, about 1100 lines

[4] Bureau, Chakir and Jacques (2007) show that contrary to assertions by many authors, agricultural preferences granted by the EU and US were largely utilized by the beneficiary countries. Other papers on the importance of agricultural preferences based on their utilization rates include: Wainio and Gehlhar (2004), Wanio and Gibson (2004), and Inama (2004).

[5] Blandford (2007) discusses in details the limitations of existing preference schemes for the LDCs and touches upon ways to address these limitations.

are duty free for the LDCs through the US preference programs.[6] However, these preferences only lower the simple average tariffs faced by the LDCs marginally (from an overall simple average of 9.7 percent to 5.6 percent for the GSP-LDC countries). This is because the dutiable tariff lines not covered in the preference programs generally have higher tariffs than those of covered products. Therefore, one would expect non-trivial trade barriers for the excluded products that originate from the LDCs. Ideally, this protection pattern should be correctly presented in the aggregated databases that are used in quantitative studies aiming at analyzing the issues relating to preferences and multilateral trade liberalization. Failing to preserve the protection pattern may lead to biased estimates regarding the extent of preference erosion. The specific consequences are explored in the next section.

3. Schemes for aggregating preferential tariffs and consequences for numerically simulating export quantity effects

Aggregation exercise using trade weights – as is done in the GTAP database – may distort the structure of preferential tariffs facing preference-receiving countries, especially the LDCs, due to the fact that typically LDCs export only a narrow range of products and volumes of these exports tend to be quite small. As such, the trade-weighted aggregated tariff may very well be under-estimated. Appendix Tables A1 and A2 provide the bilateral exports of 17 agricultural and food products (grouped according to the GTAP classification) from two aggregated Sub-Saharan African groups into major trading countries/regions for the year 2001. The first group, SSA-1, includes six individual African LDCs (Malawi, Mozambique, Tanzania, Zambia, Madagascar and Uganda) appearing in the original GTAP database version 6, whereas other African LDCs are largely included in an aggregated Rest of Sub-Sahara African (SSA-2) region. For clarities in presentation, bilateral exports less than US$1 million are shaded in the tables. Obviously, most cells in the two tables are shaded, with many of them actually being zeroes. With this trade pattern, many trade weights used for computing aggregated tariffs will be zeroes, resulting in under-estimated aggregated tariffs on imports originated from the ALDCs.

To make the point more concrete, consider the case of trade-weighted aggregated tariffs imposed by the US on imports originated from the ALDCs, which are presented in the middle panel of Table 1. Not surprisingly, these are all zeroes except for sugar

[6] These are drawn from the summary compiled by Breton and Ikezuki (2004), and Wainio and Gehlhar (2004).

and other crops, which portraits a very different protection pattern from our earlier discussion based on detailed tariff data from the USITC data web. The reason for this apparent inconsistency between the aggregated and disaggregated data is exactly due to the use of the trade-weights – according to Appendix Tables 1 and 2, sugar and other crops are two of the three products which registered non-negligible exports from the two African groups to the US. Because these African countries are not able to export to the US in most other products, tariff barriers they are facing disappear in the trade-weighted aggregation process, despite the possibilities that in the absence of such barriers, these countries might be able to export those products.

So what does this imply for evaluating the extent of preference erosion and for examining the merits of expanding preference programs (as stipulated in the Hong Kong WTO ministerial declaration)? Two claims are developed here:

Claim 1. Using underestimated aggregated preferential tariffs according to the trade-weighted scheme in simulating scenarios of MFN tariff cuts by preference-granting countries would likely result in smaller preference erosion effects.

Claim 2. Using underestimated aggregated preferential tariffs according to the trade-weighted scheme in simulating scenarios of expanding preferences would lead to a downward bias in the predicted export promotion effect of expanding preference programs.

In the case of African LDCs (ALDCs), when the TWPTs are used in relevant policy simulations, the first claim suggests that the preference erosion effects would be not as serious, whereas the second claim implies that the benefits from enhancing preferences for purposes of compensating LDCs' loss from preference erosion would be downplayed. Together, analyses based on TWPTs would incorrectly downplay the degree and extent of preference erosion and discount the potential benefits from enhancing preferences.

Intuitions of these claims can be revealed from a typical one good, three-country model setting. Suppose country G is the preference-granting country, who gives a lower specific preference tariff p to the favored preference-receiving country R and imposes a higher specific *MFN* tariff m on imports from the rest of world W. For simplicity, assume that there is only one good being traded, with G being the importer and R and W being the exporters. Now consider two situations characterized the same trade flow x between R to G, the same MFN tariff rate m imposed on exports from W,

but different specific preferential tariff rates *p*. Specifically, let us assume Situation *A* is defined by a higher initial preferential tariff p_h, whereas Situation *B* is featured by a lower preferential tariff p_l. By construct, the initial preferential margin in *A* (i.e. m-p_h) is smaller than that in B (i.e. m-p_l). Defining exports from *R* to *G* as a function of *m* and *p*, since the initial exports are the same in the two situations, we have

$$x_A(m, p_h) = x_B(m, p_l) \quad with \quad p_l < p_h < m, \quad \frac{\partial x_A}{\partial p_h} < 0, \quad \frac{\partial x_B}{\partial p_l} < 0, \quad \frac{\partial x_A}{\partial m} > 0, \quad \frac{\partial x_B}{\partial m} > 0 \qquad (1)$$

As the two types of aggregated tariffs lead to the same export with the same MFN tariff *m*, equation (1) simply says that x_A and x_B represent two different export demand curves (for exports from country *R*) by country *G*. In particular, x_B describes the export demand curve calibrated to the TWPTs (which are lower than the actual preferential protection) whereas x_A represents the export demand curve calibrated to the true preferential tariffs. Both these export demand curves decrease in the preferential tariff *p* and increase in the MFN tariff *m*.

To reveal the intuition of Claim 1, allow the preference-granting country *G* to implement an MFN tariff cut Δm, which results in a lower MFN tariff $(m\text{-}\Delta m)$ and smaller preference margins (m-Δm-p_h) and (m-Δm-p_l) respectively for Situations A and B. While absolute reductions to the preference margins are the same for both *A* and *B*, the relative reductions to the preference margins differ between the two situations. Specifically, the relative reduction to the (larger) preference margin will be $\Delta m/(m - p_l)$ in Situation *B*, which is smaller than $\Delta m/(m - p_h)$, the relative reduction to the (smaller) preference margin in Situation *A*. That is, the smaller initial preference margin under *A* would be reduced/eroded relatively more than the larger initial preference margin under *B*. Since by assumption the two initial preference margins result in the same initial preferential export flow *x* from country *R* to country *G*, one would expect that the effective impact of a relatively larger erosion of preference margin (as in Situation *A*) on the preferential export flow would be larger. With the normal assumption that lowering MFN tariff reduces preferential exports, this claim can be summarized algebraically by the following:

$$0 < \frac{\partial x(m, p_l)}{\partial m} < \frac{\partial x(m, p_h)}{\partial m} \qquad \text{where}$$

$$x(m, p_l) = x(m, p_h) \quad and \quad p_l < p_h \qquad (2)$$

In other words, *the preference erosion effect of reducing the MFN tariff (in terms of reduced preferential exports) is smaller when the initial preferential tariff is underestimated.*

The intuition of Claim 2 is straightforward. To see this, consider a preferential tariff reduction action (i.e. expanding preferences) by *G* that reduces *p* to zero. In Situation *B*, with a low initial preferential tariff p_l, the effective increase in the preference margin is smaller than that in Situation *A* (with the high initial preferential tariff p_h) because the absolute value of Δp_l (= - p_l) is smaller than that of Δp_h (= - p_h). It is then reasonable to expect that the export promotion effect of lowering *p* is smaller in Situation B than in Situation A. Essentially Claim 2 can be expressed as follows:

$$0 > \frac{\Delta x(m, p_l)}{\Delta p_l} > \frac{\Delta x(m, p_h)}{\Delta p_h} \qquad (3)$$

Note that as $\frac{\Delta x(m, p_l)}{\Delta p_l}$ and $\frac{\Delta x(m, p_h)}{\Delta p_h}$ are expected to be negative, equation (3) can be written as:

$$0 < \left|\frac{\Delta x(m, p_l)}{\Delta p_l}\right| < \left|\frac{\Delta x(m, p_h)}{\Delta p_h}\right| \qquad (3')$$

In other words, the export promotion effect of enhancing preferences (in terms of export volume) is smaller when the initial preferential tariff is underestimated. This intuitive result can again be better illustrated by using the case of the US as an example and by referring to the TWPTs extracted from the GTAP version 6 database. If the TWPTs in the GTAP database are used for evaluating the desirability of implementing the Hong Kong decision, meaningful concession would be achieved for only two product categories (see the middle panel of Table 1), which is in contradiction with the actual protection pattern mentioned earlier in the paper. As a result, smaller trade promotion effect would be resulted in, as compared to what would be obtained with a correct representation of the initial preferential protection structure.

4. Numerical simulation results under alternative aggregation schemes

To check the validity of the above claims, we construct an alternative set of aggregated tariffs that better capture the protection imposed on exports originated from the LDCs. Using these alternative tariffs (aggregated from the same source used for generating the TWPTs presented in Table 1), scenarios of MFN tariff reforms and expanding preferences can be simulated and results from these simulations are then compared to those obtained from the same simulations based on the TWPTs. Comparisons between the two sets of aggregated tariffs and between the simulation results using the two sets of tariffs provide a direct test of the two claims summarized in equations (2) and (3).

4.1. An alternative representation of protections imposed on exports from ALDCs

One way to avoid using a sparse matrix of export values in aggregating tariffs is to apply the simple average scheme, whereby all reported tariff lines under each aggregated product category are used for generating a simple average tariff. Owing to the fact that there are usually only a few tariff lines (a fraction of total lines specified by the importing country) being reported for a typical LDC, following this simple average scheme on a bilateral basis would lead to an incomplete representation of actual barriers. This is because prohibitive tariffs and tariffs for non-produced or non-exported products are likely not reported for the exporting LDC and thus not included in the aggregation. To remedy this problem, in calculating the simple average for a product category, tariff lines of that category reported for all ALDCs are pooled together. In doing so, it is assumed that for any given export destination, all ALDCs face the same import barriers.[7] This assumption can be justified by observing that ALDCs are typically grouped together under existing preference programs and generally face the same preferential or MFN tariff barriers in a given market. As such, a certain tariff line recorded for one ALDC (which is producing that product) but not for another (which is not producing or exporting that product) may very well be the applicable rate for the latter, when the latter starts to produce/export under that line.

The above procedure is applied to the source of the GTAP version 6 database at HS-6 level, resulting in a different representation of agricultural trade barriers (including

[7] Of course, the ALDCs face different barriers in different export destinations.

existing preferential tariffs) facing the ALDCs (denoted as "modified" hereafter).[8] Note that exactly the same concordance between the HS-6 and the GTAP classifications used for computing the TWPTs are applied in generating these simple average based tariffs. The upper panel of Table 1 reports modified tariffs imposed by selected countries on imports originated from the ALDCs. As compared to the original TWPTs from the GTAP database ("original" hereafter), the corresponding modified tariffs are generally larger. In the case of the US, tariff rates for oil seeds, sugar and milk are notably higher. For Japan, the difference is larger than 10 percentage points for seven products. For the two largest developing economics (China and India), the modified tariffs for many products are also significantly higher.[9]

Using a GTAP data adjustment program named ALTERTAX, bilateral import tariffs imposed on exports from the ALDCs in the original GTAP database are re-set to the levels of the modified tariffs. While the adjustment leads to changes in tariffs, the program also seeks to minimize the impact to the trade flows recorded in the original GTAP database. This procedure results in a GTAP database characterized by the modified tariffs (denoted modified database hereafter).

4.2. Experiment design

Two sets of simulation exercises are conducted to respectively test the two claims listed in equations (2) and (3). Each of these simulations is conducted separately using the two databases (the original and the modified, which differ from each other only by the aggregated tariffs). These simulations are conducted with the same standard GTAP model (Hertel, 1997), a global computable general equilibrium model widely used in trade policy analysis.

In the first scenario, MFN agricultural tariff reductions are assumed by a large preference- granting region for the purposes of comparing the different preference erosion effects resulting from the two different representations of preferential tariffs. Here, a 50% across-the-board MFN tariff reduction by the EU-25 is assumed.

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[8] The source tariff data at HS-6 level have been transferred into an MS Access database. An SQL query is developed to compute the simple average tariffs for all relevant bilateral trade flows in agricultural and food products.

[9] Tariffs calculated for the EU25 is based on the applied ad valorem tariff and tariff equivalents of other protection measures recorded in the MacMaps data set. These numbers apparently reflect a pre-EBA protection structure on products from the LDCs. Also, they correspond to the pre-EU Enlargement situation.

The second set of simulations (containing two experiments) aims at evaluating the export promoting effects of implementing the Hong Kong declaration on expanding preferential treatment for the ALDCs, in the presence of MFN tariff reforms at the multilateral level. Specifically, the Hong Kong declaration is interpreted as "deepening", "widening" and "broadening" trade preferences for the ALDCs (see Yu, 2007). Developed countries can "deepen" their preference programs by granting the ALDCs duty and quota-free market access to agricultural products that are covered in existing programs. They can "widen" the coverage of their preference programs by extending duty and quota-free access to currently un-covered agricultural products. Preferential market access for ALDC exports can also be "broadened" to include advanced developing countries to the group of preference-granting countries. The "deepening" and "widening" scenario is simulated in the first experiment, where the ALDCs are granted duty and quota-fee access to the agricultural and food markets of all developed countries, in conjunction with a 50% across-the-board MFN agricultural tariff reduction by all non-LDC countries. The second experiment adds another dimension to the enhancement of preferences for boosting exports from the African LDCs by "broadening" preferences. Taken together, the two experiments constitute the policy scenario envisioned by the Hong Kong WTO declaration.

4.3. Results

Claim 1 can be examined vis-à-vis the results from the first set of simulations on percentage changes in export quantities from the two African groups, as reported in the upper panel of Table 2. The erosion of preferences is reflected in the results of reduced exports for a number of products, especially vegetable and fruits, meats, sugar, and other foods, under both the original and modified databases. Comparing the results from using the original and the modified databases shows that in general the absolute values of percentage changes in exports simulated from the modified database are greater than those obtained from the original database. Given the same exports and the same MFN tariff rates in the two databases and the same cuts to the MFN tariff rates, the situation with lower initial preferential tariff rates (i.e. the original database) downplays the extent and degree of preference erosions, as compared to the situation with higher initial preferential tariff rates (i.e. the modified database). These results are consistent with what is stated in Claim 1.

Claim 2 can be evaluated against the results presented in the middle and lower panels of Table 2, which show the different export promoting effects of enhancing preferences. Specifically, the middle panel reports the results from the deepening and wid-

ening scenario. In general, percentage changes in export quantities simulated from the modified database are significantly higher than those obtained from the original database, suggesting that the export promotion effect is greater when the initial preferential tariff rates are higher.[10] In other words, the trade promotion effects would be underestimated should one choose to take the original GTAP database as given for examining the desirability of implementing the Hong Kong declaration. Numbers reported in the lower panel of Table 2 (i.e. the "broadening" scenario) show similar results. Understandably, the differences tend to be larger than those listed in the middle panel, suggesting that broadening trade preferences leads to extra export promotion effects. It is also worth noting that these differences are generally much more significant than those obtained from the upper panel of the same table, possibly implying a stronger support for Claim 2 than for Claim 1.

In summary, the two claims as well as the numerical simulation results suggest that using trade-weighted preferential tariff rates may risk under-estimating both the erosion effects of MFN tariff reforms and the export promotion effects of enhancing preferential treatment. In addition to these, it is also of interest to gauge the benefits to the ALDCs and the costs to the non-LDC countries due to the implementation of the Hong Kong declaration of expanding preferences. Results reported in Table 3 serve this purpose and reports the welfare effects results from an additional scenario of multilateral tariff cuts involving a 50% MFN agricultural tariff reduction by all non-LDCs is simulated, the deepening and widening scenario, and the broadening scenario discussed above. All results reported in Table 3 are based the modified database.[11]

While the assumed multilateral MFN tariff reforms would benefit most non-LDC countries, the welfare effects turn out to be negative for the two African groups (losses of about US$50 million and 184 million for SSA-1 and SSA-2, respectively). In particular, in addition to lost export volumes (reported in appendix table 3), negative export price effect also plays an important role. This negative export price effect is due to two reasons. On the one hand, multilateral MFN reforms would lead to lower prices in the export markets and hence lower prices for those ALDC exports

[10] Some percentage changes shown in the middle and lower panels of Table 2 are actually negative, due to the strong preference erosion effects of the multilateral MFN tariff cuts. Enhancing preferences help to bring down the negative changes. Furthermore, from Appendix Table 3 it can be seen that by taking into account the world market price effect of reducing MFN tariffs, it is clear that export volumes measured in US dollars are increasing for most products (see the middle and right panels of Table 3).

[11] Results on exports are provided in Appendix Table 3.

covered in preference programs. At the same time, lowering MFN market access barriers would lead to higher prices for exports from countries not receiving preferential treatment. Hence, non-LDCs countries would be able to export and crowd out exports originated from the ALDCs. On the other hand, preferential access granted to the ALDCs would actually "trap" their exports and prevent them from shifting to other markets, thereby further dampening the prices of ALDCs' exports.[12]

With preferences being deepened and widened, the negative welfare effects on the two African regions would be more than offset, leading to improved terms-of-trade and efficiency gains for them. For SSA-1, the total welfare improvement from the previous scenario would be over US$110 million, whereas for SSA-2 this would be almost US$800 million. Lastly, broadening preferences would generate similar exports expansion and welfare gains to the ALDCs. However, these additional gains are smaller than those obtainable from the action of deepening and widening preferences.

The gains to non-LDCs from multilateral MFN reforms would be only reduced marginally due to the deepening, widening and broadening actions. Table 3 shows that deepening and widening trade preferences would lead to small terms-of-trade losses for developed countries, which for instance amount to a loss of US$582 million to the EU25, a paltry number in comparison to the gains obtained from the multilateral reforms. For non-LDC developing countries, the negative impact of widening and deepening preferential treatment for the ALDCs would also be very small, implying that the expansion of exports from the ALDCs would generally not be a big concern for them. For example, China and India would only suffer welfare losses of about 4 and 17 million US dollars, respectively. Moreover, broadening preferences by the advanced developing countries would lead to very minor welfare losses for themselves as well. In summary, the cost of broadening and deepening preferences for ALDCs appear to be very minor to other countries. Although not presented here, the trade diversion effects are also very small, a result that is consistent with the ALDCs' very small export share in total world trade. Therefore, the concern on trade diversion does not appear to be a serious issue.

[12] This is related to the Armington trade structure in the model, which specifies imports from different sources as imperfect substitutes. So, trade patterns are somewhat persistent, despite changes in tariffs imposed on individual exporters.

5. Concluding remarks

This paper argues that aggregated preferential tariffs calculated according to the trade-weighted aggregation scheme tend to underestimate the true import barriers imposed on imports originated from the LDCs, due to two reasons. First, the LDCs typically only export a narrow range of products. Second, the associated export volumes are generally very small. This downward bias impacts numerical simulations aiming at estimating preference erosion effects of multilateral trade liberalization and export promotion effects of expanding preferences in the spirit of the Hong Kong WTO declaration. Two specific claims are offered. The first of these states that the downward bias would likely lead to underestimation of preference erosion effect of multilateral MFN tariff cuts. The second claim says that the export promotion effect would also be under-estimated with the biased aggregated preferential tariffs.

Taking advantage of a global bilateral tariff database at the HS-6 level, an alternative simple average based aggregation scheme is developed and the resulting aggregated preferential tariffs imposed on the African LDCs are presented. These modified tariffs are generally higher than the trade-weighted tariffs contained in the GTAP database. Numerical simulations of policy scenarios pertaining to preference erosion and preference enhancement are conducted against both the modified and original GTAP database. Results from these simulations provide support to the two claims. Having established these results, it seems that there are amble reasons for supporting the Hong Kong WTO declaration regarding expanding preferences for the LDCs. More specifically, developed and other developing countries can expand the preferential treatment on products of LDC origins by deepening preference margins of products included in existing preference programs, by widening the coverage of existing preference programs, and by broadening the group of preference-granting countries.

Table 1. Modified (simple average-based) vs. original (trade-weighted) GTAP tariffs (%)

	Aus & NZL	China	Japan	ASEAN	Indian	Canada	USA	Argen-tina	Brazil	EU25*
Modified tariff based on a simple average scheme										
wheat	0.0	1.0	117.3	3.1	100.0	1.4	2.4	5.8	5.8	**3.8**
grains	0.0	1.2	19.8	10.3	47.1	0.0	0.3	5.1	5.9	**1.7**
Veg & fruits	0.3	17.4	31.3	12.4	39.6	0.1	1.3	9.6	9.6	**6.6**
oil seeds	0.5	12.5	1.9	9.5	35.9	0.0	9.9	5.2	5.5	**1.0**
plant fiber	0.0	2.6	0.0	1.5	11.8	0.0	1.2	7.6	8.9	**0.3**
other crops	0.0	16.2	2.1	19.4	38.8	0.1	2.3	10.4	10.6	**2.7**
other animal	0.0	8.1	0.9	1.7	8.0	1.5	0.2	5.4	4.7	**1.6**
bovine meats	0.0	28.6	29.8	11.3	32.5	6.3	1.9	11.5	11.9	**14.1**
other meats	0.4	16.6	36.9	10.5	59.4	47.8	0.7	11.3	12.5	**11.2**
vege oil	0.7	21.3	5.5	7.9	70.4	1.1	1.3	10.1	10.2	**2.0**
Milk	0.5	32.1	102.7	9.6	43.6	105.0	18.6	16.5	19.5	**13.3**
Rice	0.0	1.0	950.5	20.2	74.5	0.0	3.9	12.3	15.6	**45.3**
Sugar	2.8	18.1	207.1	21.4	52.8	2.5	25.4	17.5	17.5	**63.9**
other food	0.4	19.5	10.5	11.0	38.2	1.9	1.2	12.1	12.2	**4.8**
Original trade-weighted tariff as shown in the GTAP-6 database										
Wheat	0	0	0	0	0	0	0	0	0	0
Grains	0	0	0	0	0	0	0	0	0	0
Vege & fruits	0	13.1	2.6	0.2	35.7	0	0	0	3.6	0.6
oil seeds	0.3	0	0	1.2	34.9	0	0	0	0	0
plant fiber	0	2.5	0	1.8	5.9	0	0	0	0	0
other crops	0	11.6	0	3.1	36.3	0	11.2	14.7	15.3	3.1
other animal	0	8.1	0	1.1	10.9	0.4	0	0	4.9	0.1
bovine meats	0	0	0	0	0	0	0	0	0	0
other meats	0	0	0	0	0	0	0	0	0	0.1
vege oil	0	0	0	8.6	0	0	0	0	0	0
milk	0	0	12.7	3.9	0	0	0	0	0	0
rice	0	0	0	11.3	0	0	0	0	0	13.6
sugar	0	0	0	14.8	42.8	0	20.4	0	17.4	93.9
other food	0	15.4	1.2	34.8	28.5	0	0	0	0.8	0
Differences in percentage points = modified -original										
wheat	0	1	117.3	3.1	100	1.4	2.4	5.8	5.8	3.8
grains	0	1.2	19.8	10.3	47.1	0	0.3	5.1	5.9	1.7
Vege & fruits	0.3	4.3	28.7	12.2	3.9	0.1	1.3	9.6	6	6
oil seeds	0.2	12.5	1.9	8.3	1	0	9.9	5.2	5.5	1
plant fiber	0	0.1	0	-0.3	5.9	0	1.2	7.6	8.9	0.3
other crops	0	4.6	2.1	16.3	2.5	0.1	-8.9	-4.3	-4.7	-0.4
other animal	0	0	0.9	0.6	-2.9	1.1	0.2	5.4	-0.2	1.5
bovine meats	0	28.6	29.8	11.3	32.5	6.3	1.9	11.5	11.9	14.1
other meats	0.4	16.6	36.9	10.5	59.4	47.8	0.7	11.3	12.5	11.1
vege oil	0.7	21.3	5.5	-0.7	70.4	1.1	1.3	10.1	10.2	2
milk	0.5	32.1	90	5.7	43.6	105	18.6	16.5	19.5	13.3
rice	0	1	950.5	8.9	74.5	0	3.9	12.3	15.6	31.7
sugar	2.8	18.1	207.1	6.6	10	2.5	5	17.5	0.1	-30
other food	0.4	4.1	9.3	-23.8	9.7	1.9	1.2	12.1	11.4	4.8

Sources: GTAP 6 database and own calculations based on the disaggregated tariff data set the HS-6 level from which the GTAP tariffs are derived.
*: Tariff data for the EU25 are aggregated from tariff lines for the year 2001. The Everything but Arms initiative is not reflected here.

Table 2. Export quantity effects (% changes) under modified and original preferential tariffs, various scenarios

	SSA-1			SSA-2		
	Original	Modified	Modified – original	Original	Modified	Modified – original
EU25 MFN tariff cuts; no changes to 2001 preferential tariff						
wheat	2.17	2.18	**0.01**	0.65	0.64	**-0.01**
grains	-0.39	-0.43	**-0.04**	0.2	0.16	**-0.04**
Vege & fruits	-2.51	-2.6	**-0.09**	-6.87	-6.92	**-0.05**
oil seeds	3.84	3.86	**0.02**	4.7	4.42	**-0.28**
plant fiber	1.6	1.61	**0.01**	1.91	1.9	**-0.01**
other crops	0.15	0.14	**-0.01**	-0.46	-0.5	**-0.04**
other animal	0.37	0.36	**-0.01**	-0.28	-0.31	**-0.03**
bovine meats	-13.6	-14.26	**-0.66**	0.8	0.78	**-0.02**
other meats	-1.94	-2.09	**-0.15**	-3.06	-3.12	**-0.06**
vege oil	0.93	0.94	**0.01**	-6.06	-6.09	**-0.03**
milk	-0.21	-0.31	**-0.1**	-2.98	-3.06	**-0.08**
sugar	-15.94	-16.05	**-0.11**	-47.12	-47.56	**-0.44**
other food	-3.49	-3.51	**-0.02**	-2.95	-2.94	**0.01**
Multilateral MFN tariff cuts + deepening and widening preferences*						
wheat	-3.3	0	**3.3**	-22.3	-14.1	**8.2**
grains	-5.3	-2.3	**3**	-15.5	-10.7	**4.8**
Vege & fruits	-15.7	-11.7	**4**	16.9	22.5	**5.6**
oil seeds	-6.3	0.8	**7.1**	345.4	30.6	**-314.8**
plant fiber	-4.6	-4.4	**0.2**	-10.3	-6.9	**3.4**
other crops	0.9	-3.4	**-4.3**	-19.6	-13.6	**6**
other animal	-6	0.4	**6.4**	-9.3	-4.4	**4.9**
bovine meats	-34.4	-13.7	**20.7**	-27.2	-20.3	**6.9**
other meats	-20.6	13.3	**33.9**	58.5	31.6	**-26.9**
vege oil	-14.3	-13.3	**1**	-26	-17.5	**8.5**
milk	-14.4	166.1	**180.5**	5.5	52.4	**46.9**
sugar	237.2	243.2	**6**	602.4	629.3	**26.9**
other food	-9.7	-5.4	**4.3**	-10.8	-7.9	**2.9**
Multilateral MFN tariff cuts + deepening & widening + broadening preferences**						
wheat	-7.6	-3	**4.6**	-24.4	-14.9	**9.5**
grains	-7.2	-3.5	**3.7**	-16.1	-10.3	**5.8**
Vege & fruits	30.4	41.4	**11**	23.9	30.9	**7**
oil seeds	-8	-1.9	**6.1**	343.7	28.5	**-315.2**
plant fiber	-3.3	-1.2	**2.1**	-5.8	0.1	**5.9**
other crops	2.3	0.4	**-1.9**	-18.9	-12.4	**6.5**
Other animal	-6.9	-1.4	**5.5**	-9.5	-3	**6.5**
bovine meats	-37.3	-3.5	**33.8**	-26.8	-18.3	**8.5**
other meats	82.1	69.2	**-12.9**	62.2	50.3	**-11.9**
vege oil	-10.1	-9.3	**0.8**	-27	-18.1	**8.9**
milk	-14.7	167	**181.7**	5	56	**51**
sugar	229.5	233.1	**3.6**	597.8	625.1	**27.3**
other food	-8.2	-6.5	**1.7**	-4.8	-6	**-1.2**

Source: simulation results.
*: results reported here are due to both the multilateral MFN tariff cuts and deepening and widening preferences.
**: results reported here are due to the joint impact of the multilateral MFN tariff cuts, deepening and widening preferences, and broadening preferences.

Table 3. Welfare results for selected countries/regions, based on the modified database (million US$)

	Multilateral MFN tariff cuts*			Multilateral MFN tariff cuts + deepening and widening preferences**			Multilateral MFN tariff cuts + deepening & widening + broadening preferences***		
	Efficiency	Terms of trade	Total	Efficiency	Terms of trade	Total	Efficiency	Terms of trade	Total
Australia & New Zealand	4.2	566.2	545.3	1.2	5.8	6.1	-0.2	-6.5	-6.8
China	830.8	-164.6	575.2	3.9	-1.6	-4.4	3.0	-6.1	-2.6
Japan	3263.5	-536.2	2766.7	-4.3	-37.3	-49.3	2.0	-0.7	0.5
Rest E. Asia	1141.5	-32.5	1067.6	-81.5	-27.0	-109.8	2.1	-0.9	1.1
ASEAN	554.7	289.6	760.9	-2.6	9.8	7.1	-7.5	-24.1	-31.2
India	830.8	-216.0	610.9	-6.9	-8.1	-16.6	22.5	-26.9	-4.6
Canada	674.5	-112.9	551.3	1.4	9.7	11.0	0.3	-2.4	-1.8
USA	87.5	957.0	1292.6	14.5	-68.3	-99.4	2.1	-10.7	-18.4
Mexico	321.2	-208.1	108.9	-0.1	6.3	5.8	4.2	-3.5	1.0
Argentina	46.3	259.4	270.1	-0.1	-2.4	-2.2	0.0	-1.8	-1.6
Brazil	162.2	888.0	1098.6	-3.0	-5.4	-10.3	1.2	-5.0	-4.3
EU25	5586.4	-1255.9	4276.2	-72.6	-494.1	-582.3	15.5	-33.0	-19.9
SSA-1	-1.4	-42.5	-50.0	3.9	91.4	111.8	-1.1	48.2	53.5
SSA-2	-38.9	-126.8	-184.2	168.2	527.9	772.4	17.0	66.4	91.2
World	16400.2	-12.2	16387.8	3.6	-4.6	-1.6	62.5	-0.2	62.3

Sources: simulation results.
*: results reported in this panel are due to the multilateral tariff cuts only.
**: results reported in this panel are due to deepening and widening preferences only.
***: results reported in this panel are due to broadening preferences only.

Appendix Table 1. Base case export volumes of SSA-1 (million US$)

	Australia & New Zealand	China	Japan	ASEAN	India	Canada	USA	Mexico	Argenti-na	Brazil	EU25	Mid-east N. Africa	S Afr, Custom Union	SSA-1	SSA-2	World
Paddy rice	0	0	0	0	0	0	0.2	0	0	0	0.5	0	0	0.1	1.3	2.5
Wheat	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3	0.6
Grains	0.3	0.4	0.9	0.6	0.1	0.5	3.3	0.2	0.2	0.1	8.1	0.6	0.2	10.5	9.3	36.7
Vege &fruits	0.5	0.6	3	3.9	53.6	1.3	6.7	0.3	0.2	0.3	56.8	5.6	2.7	1.2	4.8	145.9
Oil seed	0	0.1	11.2	0.4	0.3	0.3	0.8	0	0	0	4.8	1.2	2.9	0.6	1.5	25
Plant fibers	0	3.4	0.7	18.3	13.8	0.1	0	0.1	0	0	39.3	1.4	12.3	0.6	7.2	112.6
Other crops	11.1	2.5	70.1	105.3	3.7	2.9	115	10.6	1.8	2.1	505	50	22.3	34.6	79.1	1106.1
Other aminal products	0.1	1.9	1.3	2	1	0.2	3.5	0.2	0	0	10.9	2.8	1.1	1	1.9	50
wool	0	0	0	0	0	0	0.1	0	0	0	0.2	0	0	0	0	0.5
Bovine meats	0	0	0.1	0.1	0	0.1	0.4	0	0	0	0.9	0.1	0	0	0	2.2
Other meats	0.1	0.1	0.3	0.2	0	0.1	1	0.1	0	0	2.6	0.2	0.1	1.2	1.6	8.5
Vege oils	0	0	0.1	0.9	0	0	0.3	0	0	0	0.5	0	1.7	0.9	2.3	7.4
Dairy	0	0	0	0.1	0	0	0.1	0	0	0	0.1	0.1	0.1	0.2	0.5	1.2
Rice	0	0	0	0.1	0	0	0.3	0	0	0	0.8	0.1	0.1	0.4	3.3	5.6
sugar	0	0	0	0	0.1	0	16.7	0	0	0.5	37.3	7	1	10.8	44.3	118.8
Other food	0.7	1.3	39.3	12.4	0.2	1	11.4	0.4	0.3	0.2	393	6.2	10.7	3.3	29.5	538.7
Beverage Tobacco	0.3	0.3	1	0.4	0	0.5	3.4	0.2	0.1	0.1	8.4	0.6	1.2	0.3	3.3	22.8
total agfood	13.2	10.7	128.5	145.1	72.8	7.3	164.8	12.2	2.7	3.3	1073	76.3	56.4	66	190.2	2193.7
Total	28.8	104.3	290.6	290	124.4	36.5	643.4	26.6	10.2	14	3206.8	268.8	576.5	130.9	285.4	6614.2

Sources: GTAP database version 6.
Note: For presentation purposes, numbers smaller than 1 million US dollars are shaded in the table.

Appendix Table 2. Base case export volumes of SSA-2 (million US$)

	Australia & New Zealand	China	Japan	ASEAN	India	Canada	USA	Mexico	Argenti-na	Brazil	EU25	Mid-east N. Africa	S Afr, Custom Union	SSA-1	SSA-2	World
Paddy rice	0	0	0	0	0	0	0.1	0	0	0	0.2	0	0	0.1	7.4	7.9
Wheat	0	0	0	0	0	0	0	0	0	0	3.7	1.3	0	0.2	2.5	8.1
Grains	0.3	0.7	1.3	0.6	0.1	0.6	4.4	0.2	0.2	0.2	12.6	4.7	0.1	0.2	12.1	53.5
Vege &fruits	0.3	0.6	5.3	2.9	60.7	0.5	8.2	0.4	0.1	0.4	724.9	17.6	0.8	0.3	40.1	883.6
Oil seed	0	0.1	31.3	1.1	0.1	0.9	6.9	0	0	0	65.2	102.7	1.3	0.3	6	300.5
Plant fibers	0.3	3.2	3.4	194.7	107.5	2.8	0.4	7.4	0	32.3	261.5	73.4	2.5	0.3	33.4	891.8
Other crops	6.8	10.9	83.8	34.1	11.6	45.4	346.8	6.7	0.9	18.1	2195.1	225.6	9	10.6	151.5	3474
Other aminal products	0.1	3.4	1.7	7.7	12.3	0.6	7.7	0.9	0	0.1	74.7	7.5	0.4	1.1	5.8	154.1
wool	0.2	0.3	0.9	0.4	1.7	0.3	2.4	0.2	0.1	0.1	5.6	0.4	0.1	0	0.1	14.2
Bovine meats	0.1	0.2	0.3	0.1	0	0.1	1.1	0.1	0	0	3.4	22.7	0.1	0.5	0.5	30.1
Other meats	0.2	1	0.6	0.5	0.1	0.5	2.4	0.1	0.1	0.1	16.5	1.5	0.3	3.2	11	40.2
Vege oils	0.1	0.2	0.8	0.2	0	0.2	8.9	0.1	0	0	86.9	0.3	0.1	4.1	45.7	154.8
Dairy	0.1	0.1	0.2	0.5	0	0.1	0.7	0	0	0	9.1	1.6	0.1	1.4	16	31.1
Rice	0.2	0.4	0.1	0.5	0.1	0.4	2.9	0.2	0.1	0.1	5.8	0.5	0.1	0.1	17.5	30.3
sugar	0.3	0.2	0.2	0.4	0.1	0.2	15.2	0.1	0.1	0.1	295	1.4	0	0.5	17.6	338.6
Other food	9.3	28.9	104.6	59.4	1	8.4	69.7	4.6	1.3	1.9	1465.1	22.2	14.1	20.1	234.5	2180
Beverage Tobacco	0.8	1.1	6.1	1.7	0.3	2.1	15.6	0.8	0.4	0.4	42.1	2.3	0.4	4.9	85.7	173.6
total agfood	19.4	51.7	242	305.3	195.7	63.5	497.3	22	3.4	53.9	5277.3	493.2	30	47.9	728.9	8835.8
Total	144.4	2281.5	1271.5	1226.3	680.4	405.4	14625.9	218.2	109.5	1453.9	21176.1	1300.2	1537.2	381.7	2118.9	53253

Sources: GTAP database version 6.
Note: For presentation purposes, numbers smaller than 1 million US dollars are shaded in the table.

Appendix Table 3. Changes in exports of selected agriculture and food products from SSA-1 and SSA-2

	Multilateral MFN tariff cuts*				Multilateral MFN tariff cuts + deepening and widening preferences**				Multilateral MFN tariff cuts + deepening & widening + broadening preferences***			
	Export volume (million US$)		% change		Export volume (million US$)		% change		Export volume (million US$)		% change	
	SSA-1	SSA-2	SSA-1	SSA-2	SSA-1	SSA-2	SSA-1	SSA-2	SSA-1	SSA-2	SSA-1	SSA-2
Grains	35.8	48.4	-2.6	-9.5	36.3	48.6	1.3	0.4	36.3	49.1	0.1	0.9
vege &fruits	130.0	810.1	-10.9	-8.3	130.2	1109.0	0.2	36.9	212.3	1192.5	63.0	7.5
oil seeds	25.2	236.1	0.7	-21.5	25.5	403.7	1.2	71.0	25.2	398.8	-1.3	-1.2
plant fibers	112.9	896.5	0.3	0.5	108.3	841.8	-4.1	-6.1	113.3	910.7	4.6	8.2
other crops	1040.6	3322.0	-5.9	-4.4	1078.7	3047.9	3.7	-8.3	1137.6	3104.8	5.5	1.9
bovine meats	1.6	25.8	-26.0	-14.4	1.9	24.4	17.6	-5.5	2.1	25.0	12.6	2.7
other meats	7.5	36.4	-11.4	-9.4	9.7	53.8	28.9	47.6	14.6	61.6	50.5	14.5
vege oils	6.8	142.7	-8.4	-7.8	6.5	130.0	-4.5	-8.9	6.8	129.4	5.5	-0.5
dairy	1.1	29.3	-8.0	-5.8	3.3	47.9	191.6	63.5	3.3	49.1	1.1	2.6
rice	5.7	30.9	2.3	1.8	5.5	28.8	-3.7	-6.6	5.3	28.5	-3.8	-1.1
sugar	93.6	169.9	-21.3	-49.8	411.6	2507.8	339.9	1376.1	402.6	2499.4	-2.2	-0.3
other food	508.3	2058.1	-5.6	-5.6	513.7	2034.3	1.1	-1.2	511.4	2079.8	-0.4	2.2
Total Ag &food	2052.1	8226.2	-6.5	-6.9	2415.3	10697.5	17.7	30.0	2555.7	10960.3	5.8	2.5
Total	6569.2	52985.5	-0.7	-0.5	6674.8	53948.0	1.6	1.8	6718.2	54071.2	0.7	0.2

Sources: simulation results.
*: results reported in this panel are due to the multilateral tariff cuts only.
**: results reported in this panel are due to deepening and widening preferences only.
***: results reported in this panel are due to broadening preferences only.

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